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# THERAPEUTIC POTENTIAL OF AYURVEDIC MEDICINAL PLANT AGAINST SALMONELLA TYPHI

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**Abstract:**

Salmonella typhi is the causative agent of typhoid fever. It is a serious systemic infection primarily transmitted through contaminated food and water. The bacterium invades the mucosa of the intestine which leads to bacteraemia and potentially affecting the multiple organ systems. bacteraemia refers to the presence of bacteria our blood. bacteria can enter the blood in deferent ways, including wounds, medical procedures and even brushing the teeth to hard. bacteraemia can diagnose with the help of bacterial cultures and prescribed antibiotics can treat it. The symptoms of salmonella typhi include prolonged fever, abdominal pain and disturbances in the gastrointestinal tract.

The S. typhi strains can be characterized by using phenotypic or genotypic analysis. the phenotypic analysis includes phage typing is the most common used. it is done specially during illness outbreaks. the genotypic genotyping scheme divides the salmonella typhi population into four major lineages, and >75 different clades and subclades. CT18 and Ty2 are the commonly used strains of S. typhi. which share 195 out of the 204 of these genes, making them 98% identical to each other. In addition to the O and H antigens strains of S. typhi produces an antigen Vi. Effective treatment relies on antibiotics, though resistance is increasing. vaccination and improved sanitation are critical for prevention, particularly in endemic regions.

**Keywords:** Ayurvedic herbs, prescribed antibiotics, natural plant, typhoid fever, treatment of ayurvedic

## 1. INTRODUCTION

Typhoid fever is a life threating enteric infection caused by the bacterium salmonella typhi. they can multiply and spread into the blood fluids when they get ingested. Urbanization and climate change have the potential to increase the global burden of typhoid. In addition, increasing resistance to antibiotic treatment is making it easier for typhoid to spread in communities that lack access to safe drinking water or adequate sanitation [1]. typhoid fever is an illness the bacteria infect the small intestine and causes high fever, stomach pain and other symptoms include abdominal pain, vomiting, nausea etc. in the rural areas of developing countries where the proper hygiene and sanitation is not proper, the typhoid fever occurs most. countries like south and south east Asia, central and south America, Africa, and the Caribbean are the most infected countries of typhoid. Improved living conditions and the introduction of antibiotics resulted in a drastic reduction of typhoid fever morbidity and mortality in industrialized countries [2] However, the disease continues to be a public health problem in many developing areas of the WHO African, Eastern Mediterranean, South-East Asia and Western Pacific Regions [3]

As of 2019 estimates, there are 9 million cases of typhoid fever annually, resulting in about 110 000 deaths per year. Typhoid risk is higher in populations that lack access to safe water and adequate sanitation, and children are at highest risk. Antibiotics are used for the treatment of typhoid fever which may include ciprofloxacin, azithromycin, carbapenems. some newer types of the bacteria are able to survive antibiotics treatment so they can be treated with different types of antibiotics depending on the stage and type of typhoid. [4].

Some ayurveda treatment may also use to treat typhoid fever is organic plant based. Guduchi or amrita also known as Giloy, Tulsi leaves etc are used. the ayurveda treatment of typhoid focuses on boosting the immune system of the body and keeping control of the body temperature. Baptisia tinctoria is an herb from the Fabaceae family, latest studies suggested that it is used in the treatment of the TYPHOID. In this treatment of ayurvedic the used of herbs, dietary changes and strict precautions [5].

### 1.2 Symptoms of typhoid

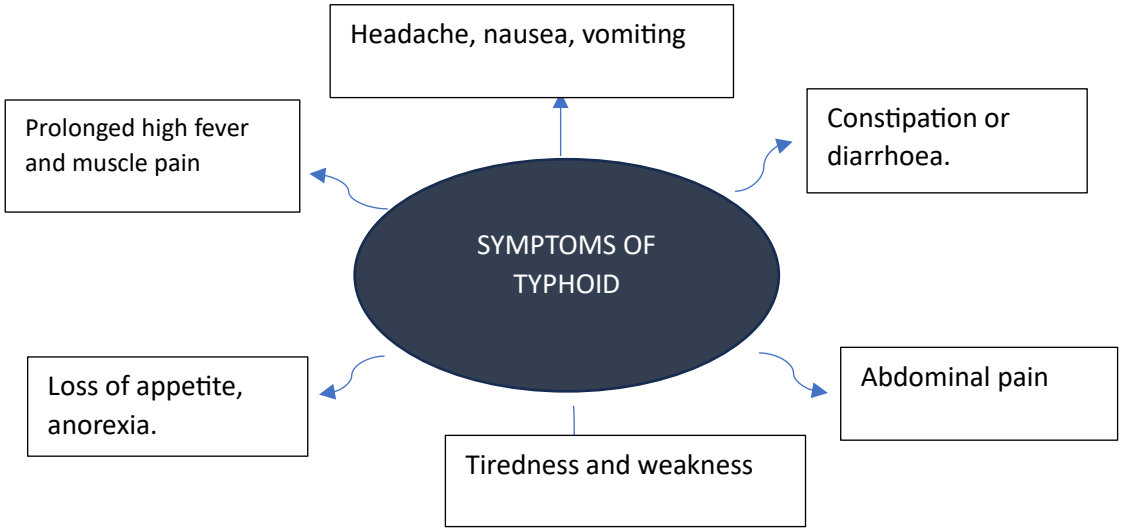


Fig 1. Symptoms of Typhoid

The symptoms of typhoid fever usually appear 1-3 weeks after exposure to the bacteria. The most common symptoms of typhoid fever include:

- High fever: Patients with typhoid fever typically experience a high fever, often up to 104°F.
- Headache: Patients may also experience a headache, which can be severe.
- Muscle aches: Patients may experience muscle aches and weakness, which can make it difficult to perform everyday activities.
- Fatigue: Patients may experience fatigue and a general feeling of being unwell.
- Abdominal pain: Patients may experience abdominal pain, which can be severe and crampy.
- Constipation or diarrhoea: Patients may experience constipation or diarrhoea, which can alternate throughout the course of the illness.
- Rash: Patients may develop a rash of flat, rose-coloured spots on the trunk of the body.

If left untreated, typhoid fever can lead to serious complications, including intestinal bleeding, perforation of the intestine, and even death [8].

### 1.3 Stages of typhoid fever

Typhoid fever can pass through several stages with symptoms appearing you're the course of 1- 4 weeks after the exposure the bacteria. The stages include the following:

#### 1.3.1 Incubation Period

It is the exposure time of the bacteria and the onset appearance of symptoms. In the stages the patient does not experience symptoms typhoid fever but the bacteria begin to multiply in the body. The period of incubation last from 3-6 days with an average of 8-14 days.

**1.2 Acute Stage** The acute stage is when symptoms of typhoid fever begin to appear. The most common symptoms include a high fever (often up to 104°F), headache, muscle aches, and fatigue. The acute stage of typhoid fever can last for several weeks, and if left untreated, can lead to serious complications.

**1.3 Convalescence Stage**

The convalescence stage is the final stage of typhoid fever, during which the patient begins to feel better as the body fights off the infection. Symptoms gradually begin to improve, and the patient's fever begins to subside. However, patients may still experience fatigue, weakness, and a general feeling of being unwell for several weeks after the acute stage of the illness has passed. In some cases, patients may experience a relapse of symptoms during the convalescence stage [9].

**1.4 Management and Treatment**

**1.4.1 Treatment of typhoid fever: -**

Typhoid is treated with antibiotics. Some newer types of the bacteria are able to survive antibiotic treatments, so you'll be treated with different antibiotics depending on what type of typhoid you have and where you got sick. Paratyphoid fever is also treated with antibiotics.

If you're severely ill or have complications, you might need additional treatments. You'll probably need to be admitted to the hospital for these treatments [10].

**1.4.2 Commonly prescribed antibiotics**

The medicine you get to treat typhoid fever may depend on where you picked up the bacteria. Strains picked up in different places respond better or worse to certain antibiotics. These medicines may be used alone or together. Antibiotics that may be given for typhoid fever are:

- Fluoroquinolones. These antibiotics, including ciprofloxacin (Cipro), may be a first choice. They stop bacteria from copying themselves. But some strains of bacteria can live through treatment. These bacteria are called antibiotic resistant.
- Cephalosporins. This group of antibiotics keeps bacteria from building cell walls. One kind, ceftriaxone, is used if there is antibiotic resistance.
- Macrolides. This group of antibiotics keeps bacteria from making proteins. One kind called azithromycin (Zithromax) can be used if there is antibiotic resistance.
- Carbapenems. These antibiotics also prevent bacteria from building cell walls. But they focus on a different stage of that process than the cephalosporins. Antibiotics in this category may be used with severe disease that doesn't respond to other antibiotics.

**Other treatments include**:

- Drinking fluids. This helps prevent the dehydration caused by a long fever and Diarrhoea. If you're very dehydrated, you may need to receive fluids through a vein.
- Surgery. If the intestines are damaged, you may need surgery to repair them.

## 2. Some ayurvedic plant herbs used in the treatment of the typhoid

The government of India has promoted the ayurvedic treatment for the better treatment of the people, which includes the use of organic plant-based herbs which are toxic less and with no side effects. Ayurveda herbs and medications are the combinations found to be effective in decreasing the symptoms of typhoid. Ayurvedic organic herbs are taken for mouth taste (bitter tasting) and it will destroy the Worms. GUDUCHI is the most commonly and recommended herb for treatment of Typhoid. LANGHANA is also used as it removes the toxins from the body. These organic herbal drugs are significant active against microbes present in the body. And it destroys and clears the Salmonella typhi bacteria from the whole body [11].

## 3. Ayurvedic view of typhoid

Ayurveda refers *jivanu* which means organisms are the causative agent for the *antrik jwara* which is a type of fever caused in the typhoid. The following are the symptoms which include –

| s.no. | Ayurveda view of symptoms | Meanings |
|---|---|---|
| 1. | *Jwara* | Fever |
| 2. | *shirahshula* | headache |
| 3. | *aruchi* | Loss of taste |
| 4. | *arati* | Loss of interest in activities |
| 5. | *malababdhata* | constipation |

Table 1. Ayurveda View of Symptoms and their Meanings

A lot of organic herbs which are used to treat typhoid are of *katu* and *tikta* rasa (pungent and bitter taste) and have *jwaraghna (fever destroying)* and *krimighna (*organism destroying) properties. they kill the microbes by reducing the *malas* (waste material in the body) or *kapha* on which the bacteria while stay and grow.

## 4. Ayurvedic herbs

- **Bilwaphal**: Bilwaphal is also known as golden apple is a herb which has astringent and aphrodisiac properties. It helps in treating the symptoms like constipation, in digestion and dysentery. it also reduces typhoid fever when given in the early stages.
- **Jatamansi**: Jatamansi is also known as muskroot. it is a herb that has carminative, aromatic and digestive properties. this herb is used in treating jaundice, typhoid and gastric disorders. It eliminates the impurities which are found in the blood.
- **Haritaki:** Haritaki is also known as chebulic myrobalan. it is a herb which has rejuvenating properties. it acts as a laxative, removes phlegm (expectorant) and is a tonic for the body. this herb is helpful in the treatment of various diseases like anaemia, jaundice and typhoid fever.
- **Guduchi**: Guduchi: (Guduchi) is a large, globous, deciduous climbing shrub belonging to the Menispermaceae family. It extends all over the tropical Indian subcontinent to China, ascending even up to 300 m above sea level. The Hindi name of the plant is Giloe [12] which is a Hindu mythological term for the drink that has saved celestial beings from old age and kept them eternally young. Other common names and synonyms are *Guduchi, Amrita, Amrita Valli, Madhu Parni* Guduchika, Chinnobhava, Vatsadani, Tantrika, Kundalini, Chakralakshanika (Sanskrit), *Gulancha* (Bengali), *Gurcha* (Hindi), *Garo,Galac* (Gujarati), *Thippateega*(Telugu), *Am rutavalli* (Kannada), *Amrita,Gilo* (Kashmiri), *Chittamrutu* (Malayalam), *Gulvel* (Marathi), *Guluch i* (Oriya), *Giloy* (Punjabi), *Seendal, Seendil Kodi* (Tamil), *Siddhilata, Amarlata* (Assamese) Heartleaf Moonseed, Tinospora (English) [13] *Guduchi*, the Sanskrit name, means one which protects the entire body.

Guduchi, which is also known as Tinospora cordifolia, is a herbal medicine that has been widely used in traditional medicine systems such as Ayurveda for many centuries. Guduchi is an herbaceous plant that is believed to have a positive effect on the immune system, the digestive system, and the inflammatory and oxidative stress mechanisms in the body, thus, promoting good health.

Its uses Guduchi that is grown more on the development of fever, helps to control diabetes, and makes the liver function more magnificently. The product can be taken in the form of its various powder organizations. Also, it can be trailed as a capsule in putting one-decoctions or preparation kits of stem in boiling water for 3 hours to be taken as a hot drink or a non-alcoholic-drink. In India, it is also known as "Giloy"[14]

### 4.1 Bilva Phal

Yes, Bilva Phal (Aegle marmelos) is a well-known plant in Ayurveda and traditional medicine, which helps to heal a variety of ailments, typhoid fever and Salmonella infections being among them. It is used traditionally to treat typhoid fever, diarrhea, and the infection due to Salmonella.

How Bael (Bilva Phal) Helps in Treating Typhoid (Salmonella Typhi)

**Antimicrobial Properties –** Bael fruit and leaves naturally contain components (tannins, flavonoids, and alkaloids) that are capable of fighting against the bacteria Salmonella Typhi.

**Boosts Immunity –** The herb works in the body to provide it immune power so it can more easily provide the infection with the boot.

**Improves Digestion –** Bael is well known for bringing the digestive system back on track among negative problems like diarrhea or dysentery, which are the most prominent symptoms during the course of typhoid.

**Anti-Inflammatory –** It (bael) also has activities that are associated with reducing inflammation in the intestines thereby leading to a cure of a typhoid outbreak [15].

### 4.2 Jatamansi

*Withania somnifera (L.)* Dunal (Solanaceae) and Meanwhile, Nardo Stachys jatamansi DC. (Valerianaceae) and Selenium vaginatum CN. Clarke (Umbellifer) are also important indigenous drugs found in Himalayan region. Roots and rhizomes of N. jatamansi, as described in Ayurveda, have been added in different herbal preparations including supplements. This important traditional medicine is also known to cure epilepsy, hysteria, syncope, convulsions, and mental weakness [13] The decoction of the drug is also useful in neurological disorders, insomnia, and disorders of the cardiovascular system. It has been reported to exhibit antidepressant, anticonvulsant, and antiarrhythmic activities as well as antioxidant and inhibition of lipid peroxidation activities.

## 5. Conclusion

Typhoid fever complications may include gastrointestinal, cardiovascular, neuropsychiatric, respiratory, or hematologic [17] Relapse and chronic carriage may ensue. Despite surgical intervention, severe complications such as intestinal haemorrhage and perforation can prove rapidly fatal [18] the emergence of multidrug resistant (MDR) and now extensively drug resistant (XDR) Salmonella Typhi limits treatment options and may be associated with greater odds of complications and deaths [19] Typhoid fever caused by NARST infection is associated with poor clinical outcomes, probably due to delay in initiating appropriate antibiotic therapy. Clinically this translates into frequent failure of

fluoroquinolone therapy [20] However, this is not reflected in current NCCLS breakpoints and hence the fluoroquinolone breakpoints need to be redefined for S. typhi. The data obtained in these studies justify the use of these ayurvedic herbal preparations in medical practice by majority of the populations in India. Plenty of disorders have been found referred to in the ancient Vedic literature either directly naming the disease itself or by hinting at the nature of the disorder. Typhoid fever symptomatically resembles many of the conditions explained in classical texts such as Pittaulbana Sannipataja Jwara and Visham Jwara [14]. The Nidanas which are explained for Janapadodhwansa (Dooshita Jala and Dooshita Anna) are considered to be the main Nidanas of Pittaulbana Sannipataja Jwara which are very similar to the causative factors of typhoid fever in modern. the traditional use we have evaluated, for the first time, the anti-typhoid potential of S. robusta tender leaf extracts (AE and ME) using in vitro and in vivo model [16]. The study also supports the use of these herbal preparations not only as the dietary supplement but also as agent to prevent or control the enteric bacterial infections.

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